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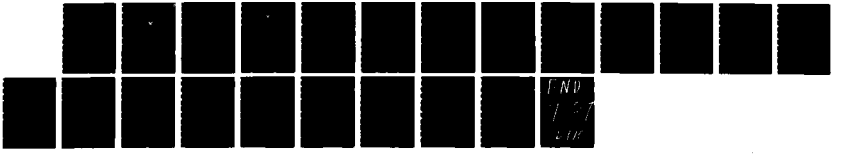

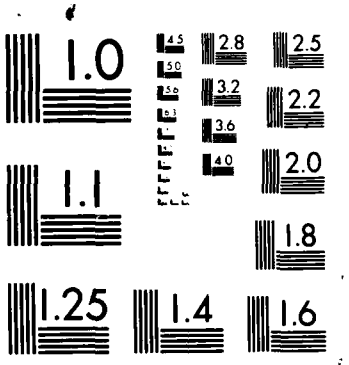
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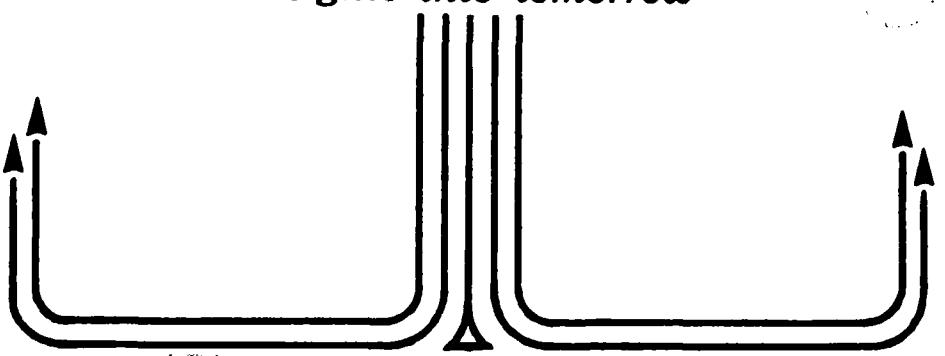
STUDENT REPORT

F/A-18D HORNET
MAGTF FORCE MULTIPLIER OF THE 1990'S

MAJOR ROBERT R. ZIMMERMAN 87-2815

"insights into tomorrow"



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REPORT NUMBER 87-2815

TITLE F/A-18D HORNET - MAGTF FORCE MULTIPLIER OF THE 1990's

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Submitted to the faculty in partial fulfillment of requirements for graduation.

AIR COMMAND AND STAFF COLLEGE
AIR UNIVERSITY
MAXWELL AFB, AL 36112

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED	1b. RESTRICTIVE MARKINGS
2a. SECURITY CLASSIFICATION AUTHORITY	3. DISTRIBUTION/AVAILABILITY OF REPORT STATEMENT "A" Approved for public release; Distribution is unlimited.
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE	
4. PERFORMING ORGANIZATION REPORT NUMBER(S) 87-2815	5. MONITORING ORGANIZATION REPORT NUMBER(S)
6a. NAME OF PERFORMING ORGANIZATION ACSC/EDCC 6b. OFFICE SYMBOL (If applicable)	7a. NAME OF MONITORING ORGANIZATION
6c. ADDRESS (City, State, and ZIP Code) Maxwell AFB AL 36112-5542	7b. ADDRESS (City, State, and ZIP Code)
8a. NAME OF FUNDING/SPONSORING ORGANIZATION 8b. OFFICE SYMBOL (If applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
8c. ADDRESS (City, State, and ZIP Code)	10. SOURCE OF FUNDING NUMBERS PROGRAM ELEMENT NO. / PROJECT NO. / TASK NO / WORK UNIT ACCESSION NO.

11. TITLE (Include Security Classification)

F/A-18D HORNET - MAGTF FORCE MULTIPLIER OF THE 1990'S (U)

12. PERSONAL AUTHOR(S)

Zimmerman, Robert R., Major, USMC

13a. TYPE OF REPORT	13b. TIME COVERED FROM _____ TO _____	14. DATE OF REPORT (Year, Month, Day)	15. PAGE COUNT
		1987 April	21

16. SUPPLEMENTARY NOTATION

17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUB-GROUP	

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

This article for publication is intended to inform the reader of the impact the F/A-18D multi-mission strike-fighter will have on Marine Aviation during the 1990's and beyond. As an authentic force multiplier to the Marine Air-Ground Task Force commander, the F/A-18D Hornet will offer a single source of reliability and effectiveness in the anti-air warfare, offensive air support, aerial reconnaissance, and air command and control missions. Specific areas addressed include:

1. The expanded VMFA mission statement
2. The F/A-18D Hornet's capabilities
3. The Naval Flight Officer's role
4. Future VMFA restructure and supportability.

The article concludes that the dual-cockpit Hornet is potentially the most versatile and unique tactical aircraft in the world with its multi-mission capabilities

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT	21. ABSTRACT SECURITY CLASSIFICATION
☐ UNCLASSIFIED/UNLIMITED ☒ SAME AS RPT. ☐ DTIC USERS	UNCLASSIFIED
22a NAME OF RESPONSIBLE INDIVIDUAL ACSC/EDCC Maxwell AFB AL 36112-5542	22b TELEPHONE (Include Area Code) (205) 293-2483 22c. OFFICE SYMBOL

PREFACE

STATEMENT OF PROBLEM

To date, there has not been a published article in any professional journal dedicated solely to the two-seat F/A-18D Hornet, its multi-mission capabilities, the role of its second crewman, or its progress in meeting its initial operational capability (IOC) date. This article's purpose is to inform interested readers of the tremendous impact the two-seat Hornet will have on Marine Aviation into the next century.

Tomorrow's Marine Air-Ground Task Force (MAGTF) is postulated to operate on a battlefield dominated by sophisticated electronic warfare, massive firepower, and incomprehensible lethality. To meet this anticipated challenge the MAGTF commander must judiciously combine his air arm with other supporting arms to ensure mission accomplishment. For Marines, air power is relatively ineffectual if it does not translate to ground power.

The 1990's will showcase the Marine Corps owning the most technological, versatile, and flexible tactical air arm in the world. Marine Aviation is quickly embarking on an exciting era with a composite force of tilt rotor and attack helicopters, and VSTOL and multimission strike-fighter aircraft. With the advent of the F/A-18D strike-fighter, the MAGTF commander will have unprecedented firepower, lethality, versatility, and reliability from a single source.

OBJECTIVES

This article focuses on the MAGTF's primary tactical aircraft of the 1990's, the F/A-18D Hornet. It identifies the expanded mission statement of the proposed reorganized Marine Fighter Attack Squadron (VMFA), explores the F/A-18D's capability to accomplish these assigned missions, investigates the NFO's role, and discusses the program's progress in meeting its initial operational capability date of October 1989. Subject to clearance, this manuscript will be submitted to the *Marine Corps Gazette* for consideration.

ABOUT THE AUTHOR

Major Robert R. Zimmerman was commissioned a Second Lieutenant in the United States Marine Corps upon graduation from the U.S. Naval Academy on 7 June 1972. After completing The Basic School at MCB Quantico, Virginia, he entered flight training at NAS Pensacola, Florida in February 1973. He was designated a Naval Flight Officer at NAS Glynco, Georgia in November 1973. His aviation assignments have included tours with five Marine fighter squadrons: VMFAT-201, VMFA-122, VMFA-235, VMFA-112, and VMFA-212. Having wide experience in administrative, maintenance, and operational billets, he last served as VMFA-212's Operations and Executive Officer. He has also completed assignments as a Forward Air Controller for 3rd Battalion, 3rd Marines and as the G-3 Plans Officer, 1st Marine Brigade. He has flown over 3,000 flight hours in the F-4 Phantom in the course of completing four WestPac deployments. He is a graduate of both the Navy Fighter Weapons School (TOPGUN), NAS Miramar, California and the Weapons and Tactics Instructor (WTI) course, MAWTS-1, MCAS Yuma, Arizona. His professional military education includes graduation from the Amphibious Warfare School and the USMC Command and Staff College, MCB, Quantico, Virginia. He holds a Bachelor of Science degree in Analytical Management and a Master of Science degree in Management Information Systems. He has been personally decorated with the Meritorious Service Medal and the Navy Commendation Medal. He is currently attending the USAF Air Command and Staff College, Maxwell AFB, Alabama.

A-1

FA-18D HORNET
MAGTF FORCE MULTIPLIER OF THE 1990's

Back to the Future. Dateline: Winter, 199x. Time: 0130. A Marine Amphibious Brigade is committed to a low intensity conflict in a third world country. As a company commander, you have been issued a warning order to commence an assault on Battalion Objective Alpha at 0200. Just prior to sunset, a reconnaissance aircraft had made a quick pass over the objective area. Real-time imagery of the day's interdiction strikes was transmitted via data-link to the Brigade G-2 for immediate bomb damage assessment (BDA). The enemy's anti-aircraft artillery (AAA) had been silenced by Rockeye and his surface-to-air missile (SAM) sites had been neutralized by High-speed Anti-Radiation Missiles (HARM). Coupled with the day's aerial engagements by the combat air patrol (CAP) aircraft, these suppression of enemy air defense (SEAD) missions have severely weakened the enemy's integrated air defense system assuring air superiority for the night assault.

Your Forward Air Controller (FAC) has just informed you that the Tactical Air Coordinator (Airborne) (TAC(A)) aircraft had checked in with the Improved Direct Air Support Center (IDASC) and was briefed on your previously submitted Tactical Air Request. The Fire Support Coordination Center (FSCC) is monitoring artillery and naval gunfire requests for general fire support. The TAC(A) aircraft, also assuming a role of Supporting Arms Coordinator (Airborne) (SAC(A)), will be coordinating and adjusting the naval gunfire as your company advances.

At 0155, your company anxiously awaits the signal to advance from the line of departure. Your FAC is laser designating preplanned targets for two close air support (CAS) aircraft as they unleash their ordnance on target with surgical accuracy and decisive lethality. Two more aircraft are holding at a control point for on-call CAS missions.

Incredibly, this entire spectrum of anti-air warfare, offensive air support, aerial reconnaissance, and air command and control missions was performed by aircrew flying the FA-18D Hornet. Not only were all missions accomplished by a single type aircraft from a single Marine Fighter Attack Squadron (VMFA), but they were also achieved with a precision, reliability, and effectiveness far superior to any of the FA-18D's predecessors.

Today's Problem. Conceivably, if this hypothetical scenario was to occur in 1987, the various missions would be flown by a myriad of mission-specific aircraft. The daylight interdiction and SEAD missions would be performed by either A-4M Skyhawks or AV-8B Harriers. The reconnaissance mission would be flown by the RF-4B Phantom, while the FAC(A)/TAC(A)/SAC(A) missions would be conducted by either OA-4M Skyhawks or OV-10D Broncos. The night CAS would probably be carried out by A-6E TRAM Intruders. Finally, the combat air patrol and fighter attack escort missions would be the responsibility of F-4S Phantoms or FA-18A Hornets. Perhaps as many as eight different fixed-wing aircraft types would directly support this night assault. Parenthetically, this combat support would also require the incumbent maintenance, logistical, and personnel support of these eight unique aircraft squadrons.

Tomorrow's Solution. The future Marine Air-Ground Task Force (MAGTF) is postulated to operate on a battlefield dominated by sophisticated electronic warfare, massive firepower and incomprehensible lethality. To meet this anticipated challenge the MAGTF commander must judiciously match his weapon system capabilities to mission requirements. Soon, he will have at his disposal a single source of unprecedented firepower, accuracy, versatility, and reliability as the FA-18D Hornet replaces today's outdated and outmoded tactical aircraft. This article focuses on the MAGTF's dominating force multiplier of the 1990's -- the FA-18D Hornet. It defines the expanded mission statement of the future VMFA squadron, discusses the FA-18D's capability to accomplish this mission, explores the Naval Flight Officer's (NFO) role, looks at the future VMFA organizational support structure, and investigates the FA-18D's current status in meeting its projected initial operational capability (IOC) date.

THE MAGTF: The Fighter Attack Squadron

Mission Statement. Multiple technological improvements and a second cockpit added to the proven F-18A airframe have yielded a true multi-mission capable aircraft. Recognizing the potential dimensions of this aircraft, the Marine Corps has restated and redefined the mission of future FA-18D equipped fighter attack squadrons to be:

> Intercept and destroy enemy aircraft under all weather conditions, attack and destroy surface targets under daylight, night and under-the-weather conditions, conduct multi-sensor aerial reconnaissance, provide TAC(A), FAC(A), and SAC(A)) support to the Marine Air-Ground Task Force and conduct other air operations as may be required. (11:2)

Specific Tasks. Additions to the current VMFA mission statement were highlighted for emphasis. Obviously, this expanded mission statement demands a multiplicity and variety of roles and tasks for future Marine fighter attack squadrons. Specifically, these tasks include:

>> Intercept and destroy enemy aircraft threatening Marine bases, support systems and ground forces in conjunction with ground and airborne fighter control, under all-weather conditions;
>> Attack and destroy enemy lines of communication, airfields, seaports and supply lines under daylight, night and under-the-weather conditions;
>> Provide fighter attack escort for friendly aircraft against enemy interceptors, as required, under all weather conditions;
>> Deploy and operate from aircraft carriers and provide Fleet Air Defense against high and low altitude threats, as directed;
>> Conduct responsive close air support (CAS) and deep air support (DAS) during day, night, and under-the-weather conditions;
>> Conduct day, night, and under-the-weather aerial multi-sensor imagery, target damage assessment and armed reconnaissance; and
>> Provide TAC(A), FAC(A), and SAC(A) as assigned. (11:3)

THE FORCE: The FA-18D's Capabilities

Anti-air Warfare. Anti-air warfare not only requires air superiority over the objective area, but also demands escorting more vulnerable friendly attack aircraft and helicopters to their objectives. By doctrine, air superiority is a prerequisite for amphibious operations and subsequent operations ashore. The current Hornet airframe, the FA-18A, has repeatedly demonstrated its predominance as an air superiority fighter. (5:74) The advanced aerodynamic design, in conjunction with a quad-redundant electronic flight control system, has resulted in a fighter with superb manueverability and reliability. Combined with an upgraded radar system, a profound advancement in air-to-air missiles, and an additional cockpit, the FA-18D will be overpowering in the air combat arena.

The next generation weapon, the Advanced Medium Range Air-to-Air Missile (AMRAAM), is scheduled to complete final testing coincidentally with the FA-18D's projected Fleet Marine Force arrival. This all-environment, beyond visual range, multiple target, air-to-air weapon incorporates an indigenous active radar in conjunction with an inertial reference unit and microcomputer system to give the FA-18D an unprecedented "launch and leave" capability. Independent of the aircraft's

own fire control system after launch, the missile closes on the target until its active radar seeker guides it to final interception. The radar's track-while-scan technology allows simultaneous commitment of several missiles at multiple targets. The pilot may then elect to disengage and perform evasive maneuvers while the missiles guide to impact. (9:2) With the two-seat Hornet, the MAGTF commander will soon inherit a formidible air superiority fighter capable of destroying numerically superior forces. This improved Hornet can and will secure the necessary air space for amphibious operations and subsequent operations ashore.

Offensive Air Support. The Hornet's digital avionics design permits easy mission alteration by a single switch for either the air-to-air or air-to-ground mode. The only difference between the FA-18D fighter or attack configuration is the missionized equipment carried externally. Specific external attack sensors include forward looking infrared (FLIR), laser spot tracker, and Thermal Imaging Navigation Set (TINS) subsystems. (10:8) Carrying an array of air-to-air and air-to-ground weapons in conjunction with a FLIR pod on most missions, the improved Hornet will be an authentic multi-role "Strike-Fighter." Its true war fighting capability is manifested in the aircraft's dramatic ordnance delivery potential. The MAGTF commander will have at his disposal a versatile aircraft capable of accurately delivering over *50 different weapons!* (7:26) Furthermore, new generation standoff ordnance will inflict the greatest possible damage with minimum risk to the Hornet or its crew. The following weapon system enhancements provide a significant increase in combat capability over the FA-18A:

(a) Night Vision Goggles (NVG);
(b) NVG Compatible Lighting;
(c) Raster Heads-up Display (HUD);
(d) Thermal Imaging Navigation Set (TINS);
(e) Data Storage Set (DSS);
(f) Digital Map Set (DMS);
(g) Multi-Purpose Color Displays (MPCD);
(h) Airborne Self Protection Jammer (ASPJ);
(i) Imaging Infrared (I^2R) Maverick;
(j) Advanced Medium Range Air-to-Air Missile (AMRAAM);
(k) Two aft cockpit sensor controllers;
(l) Decoupled front/rear cockpit displays and sensor controllers; and
(m) Aft cockpit launch capability of selected air-to-air/air-to-ground weapons.

The night under-the-weather attack capability increases the aircraft survivability by capitalizing on the cover of darkness while overcoming many navigation and target detection obstacles associated with reduced visibility operations. The system integrates several components to enable

the Hornet to be operated at night at low altitudes, thereby negating the growing electro-optics of the enemy's integrated air defense system. First, the cockpit incorporates a major technological advance in the night attack cockpit lighting. The design is compatible with day or night operations and enables the aircrew with NVG's to fly and manuever close to the ground at night. Second, the TINS allows precise identification of enemy forces by providing "hot spot" cueing of potential targets. The TINS video, flight symbology, and navigational data are superimposed on a rasterized HUD for out-of-the-cockpit orientation. This improved HUD has a wider field of view, is more transparent, has brighter symbology and reduces glare by using a combination of diffraction optics, holographic techniques, and laser technology. Third, a digital moving map set and a multi-purpose color display further reduce the potential for disorientation common to night low altitude and reduced visibility operations. (10:--)

Additionally, the ASPJ permits the Hornet to effectively counter advanced threat radars, both in frequency range and radar techniques. Coupled with the DSS addition, which permits last minute insertion of target locations and threat data, the ASPJ allows the FA-18D to confidently respond to a mobile threat. Thus, the DSS can aid in precise target location for possible engagement by the I^2R Maverick. This day or night air-to-ground missile increases first pass probability of kill through improved target acquisition and reduces aircraft exposure to enemy fire by its standoff range of attack. Finally, the austere all-weather capability is enhanced through an independent aft cockpit, allowing the NFO to share in the increased work load of this task-saturation mission. These multiple improvements promise an FA-18D operational enhancement far exceeding any other attack aircraft flying today, especially during reduced visibility or night low-level attack. (10:--)

Air Reconnaissance. The FA-18D will also be assigned reconnaissance and surveillance as a primary mission. Providing state-of-the-art, near real-time, all-weather target imagery for the tactical commander, this completely modernized tactical reconnaissance system will have the unique capability to locate and target camouflaged, mobile forces. The two major components of this system are the FA-18D and the ground-based receiving and exploitation system, the All-Source Imagery Processor (ASIP). The platform's survivability will be enhanced by its low-altitude standoff collection using all-weather Side Looking Radar (SLR) and electronic sensors that record imagery on magnetic tape on board the aircraft. No known system will replace imagery for intelligence and targeting, and SLR is the only all-weather capable imagery sensor. It is also the only sensor that is not being considered for first generation Remote Piloted Vehicles (RPV). Once the imagery is recorded, it may be played back through a data-link transmitter while the aircraft is in flight. (2:112) Combining multi-sensor imagery with an array of precision weapons gives

the FA-18D a unique subsidiary mission of armed reconnaissance. In less than eight hours the internal gun can be replaced by a reconnaissance pallet for this mission. The squadron's indigenous capability to detect, locate, and destroy enemy forces in real-time and in all-weather increases the MAGTF's combat capability several fold.

Air Command and Control. The air command and control mission is segmented into three separate but interrelated functions; FAC(A), TAC(A), and SAC(A). The FA-18D's dual-cockpit allows division of tasks in this demanding mission. The trained NFO coordinates air space management of aircraft to, in, and from a designated operating area at the direction of the DASC. He is also responsible for briefing CAS aircraft, enroute and terminal control procedures, BDA observation and reporting, and artillery air spotting and naval gunfire procedures. Assigning the SAC(A) mission to the Hornet corrects a deficiency in controlling and adjusting naval gunfire identified during the 1983 Lebanon experience. The pilot is thus free to concentrate on low altitude attack tactics, visual reconnaissance, and locating, identifying and marking tactical targets.

Future air command and control will be exponentially improved over current systems for three main reasons. First, most command and control problems today may be traced to either miscommunication or lack of prior planning. Since the future VMFA squadron will be composed of both fighter/attack and control aircrew as squadron mates, aircrew who are controlling one day may be the ones who are controlled the next. Replacing past intersquadron competition, intrasquadron cooperation will translate to better communication, coordination, and control as aircrews expeditiously identify and resolve problems. Second, the FA-18D's airspeed, manueverability, and self-protection allow it to be more survivable than its predecessors. Finally, the airplane's dual-cockpit configuration of High Frequency (HF) and multi-mode (UHF/VHF/FM) radios allows reliable communications with all other supporting agencies, flight elements, and ground forces. The UHF and VHF bands, employing the latest anti-jam capabilities, are also compatible for all joint Service operations. Thus, the future Marine air-ground team, exploiting the FA-18D's profound improvements in communications and coordination, gains a reliable and vital command and control link between the tactical ground commander and his supporting air arm.

THE MULTIPLIER: The Second Seat Considerations

Crew Coordination. With its multi-mission capabilities, sophisticated weaponry, and advanced avionics technology, the two-seat FA-18D will be the most versatile and unique tactical aircraft in the world. The aircraft, itself, is only one variable in the total weapon system equation.

Its enormous performance potential requires a skilled and knowledgeable pilot/NFO team, synergistically combining their talents to effectively exploit the sophisticated weapon system. With proper crew coordination, the FA-18D reaches an effectiveness and survivability threshold never before achieved in Marine Aviation, especially in night and high threat environments. One principle reason for adding the second cockpit to the FA-18A/C was to reduce the pilot's potential for task overloading during these conditions.

> Task overloading is a well-established phenomenon. First the operator devotes less attention to each task in an attempt to complete them all ... the operator then must either concentrate on the completion of one task to the detriment or exclusion of others, or drop it altogether in favor of a more critical element, eventually resulting in what might be called "task fixation." (1:237)

Whether called task overloading, saturation, or fixation, the result is severe degradation in mission performance and increased aircraft vulnerability. Crew coordination, the division of tasks and responsibilities between the two cockpits, will best optimize the total weapon system and ensure mission accomplishment.

For example, during air to air engagements, the backseater will assist the pilot in radar detection, target sorting, threat analysis, tactical game plan, target identification, information processing, situational awareness, and weapons employment. If the aerial battle develops into a dogfight, the NFO will perform visual lookout responsibilities while the pilot concentrates on prosecuting the attack. Historically, most (80%) aerial combat kills are achieved without the victim observing his attacker. Considering the F-4 Radar Intercept Officer (RIO) is credited with the majority of enemy aircraft sightings in Southeast Asia, one can logically deduce that a number of friendly aircraft were preserved by the RIO's lookout. (4:63) "In terms of visual lookout, a two-member crew is more capable of maintaining better surveillance for surface-to-air threats and hostile aircraft than is a single pilot." (8:78) This fact is constantly validated in such peacetime multi-plane arenas as Red Flag and Cope Thunder exercises. Although 20 years older than its single-seat replacements (F-15, F-16, FA-18A), the two-seat F-4 still owns one of the lowest attrition records and achieves a disproportionate share of aerial kills because two aircrew share lookout and other task responsibilities. (13:--) Had the two-seat Hornet been procurred for this improved survivability factor alone, it would more than compensate for the additional expense.

The two-cockpit FA-18D Hornet is revolutionary in its concept of crew coordination. Past experience with two-seat aircraft dictated a division of task loading based on mission-specific equipment located in each crew

station. Conceptually, the FA-18D two-seat cockpit design is based on shared task performance using decoupled displays and sensor controls while simultaneously preserving the aircrew-machine interface. The enhanced capability of a properly trained crew to process information will improve situation awareness, enhance survivability, and, ultimately, ensure mission success. Crew coordination will require more than just lip service if the FA-18D's true potential is to be realized. To develop and refine the teamwork necessary to exploit the system's total capabilities, the same pilot and NFO will need to fly together almost exclusively. (12:--)

Profile of the NFO. Tomorrow's FA-18D NFO will be a composite of today's F-4 Radar Intercept Officer, A-6 Bombadier/Navigator, RF-4 Aerial Reconnaissance Officer, OA-4 Aerial Observer and EA-6B Electronic Counter Measures Officer. His specialized skills in all mission areas, in synchronization with his pilot, will yield a true force multiplier.

In war and peace, an extra crewmember has consistently proven to be the difference between either being ahead or behind the aircraft, accomplishing or failing the mission, or saving or losing an airplane. Comprehensive studies on aircraft cockpit configurations conducted by the Department of Defense, defense contractors, and allied forces identify two universal conclusions; the dual-seat option has higher personnel, maintenance, and procurement costs, and two-seat aircraft survivability and mission effectiveness exceed single-seat performance. Other Services and allies have also adopted the two-seat concept in order to reduce the pilot task overload in high task environments. Recently, the U.S. Air Force procurred the two-seat F-15E Strike Eagle (3:19) and the British Royal Air Force deployed their new tandem-seat Tornado. Astutely, the Marine Corps also opted for a multi-capable dual-seat strike fighter because, in combat, the marginal higher cost was considered inconsequential to mission accomplishment in support of the MAGTF.

THE 1990's: The future outlook

Supportability. Recognizing the FA-18D's unique multi-mission potential, Marine Corps planners foresee improved aircraft readiness and supportability by the reduction of aircraft models in the current inventory; Marine Aviation presently supports 19 different fixed wing aircraft types or models. By 1992, that number should be reduced to eight in large part to the multi-mission role assumed by the FA-18D. Not only does mission consolidation provide for logistical commonality, but it also has far reaching benefits in personnel stability and maintenance reliability.

In the past, maintenance personnel have moved between communities at the needs of the Corps -- a trained A-4 hydraulicsman or

avionics technician could find himself working on AV-8's or F-4's or A-6's on his next assignment. An immediate benefit of this consolidation will be the resultant stability of maintenance personnel within their military occupational specialty. This continuity will equate to reduced personnel training requirements and costs, and ultimately improved aircraft readiness.

The current FA-18A's maintainability is "unprecedented for a system of its complexity ... the maintenance manhours required to support the FA-18 have been reduced to less than half those required of its F-4 predecessor." (6:54) The aircraft was designed to minimize the required support equipment to permit MAGTF operations at austere forward bases. The FA-18D's maintainability and reliability will be even further enhanced by the incorporation of new subsytems and modes. Computer software changes, capitalizing on the latest technical improvements, will replace today's expensive and complicated hardware changes, thus yielding improved aircraft availability rates. An upgraded radar power supply will also greatly enhance weapon system reliability.

Organizational Structure. The future VMFA squadron's aircraft allowance will be increased from 12 to 16 aircraft -- eight single-seat FA-18C's and eight dual-cockpit FA-18D's -- with a table of organization of 24 pilots and 12 NFO's. This organizational structure provides the greatest flexibility of assets and potential for mission accomplishment with respect to reasonable acquisition costs, squadron manning levels, and training syllabus requirements.

The mix of FA-18C's and D's in operational squadrons will greatly impact syllabus development and training requirements. The comprehensive training syllabus required for aircrew proficiency in all assigned missions may exceed an individual aircrew's capabilities and may dictate a two or three tier training syllabus within each squadron. In other words, it may be prudent to train all aircrew in generic air-to-air and air-to-ground skills, with concentrated training for designated aircrew in subspecialties, such as reconnaissance, air control or night under-the weather attack. This training and readiness syllabus is under further analysis and investigation by the USMC FA-18D Operational Development Team (ODT) at NAS Lemoore, California, to ensure operational procedures and employment tactics mature concurrently with the FA-18D's development.

Current Status and Initiatives. Besides the ODT, several other organizations and agencies are monitoring a sound and coherent plan for meeting the FA-18D's scheduled initial operational capability (IOC) date. The Aviation Plans and Policies Branch at HQMC has primary responsibility for monitoring and directing the FA-18D's progress. The ODT, in conjunction with the Aircrew System Advisory Panel (ASAP), is

consolidating inputs from fleet operational squadrons, Air Test and Evaluation Squadron - Four (VX-4), Naval Air Test Center, and Marine Aviation Weapons and Tactics Squadron - One (MAWTS-1) in the human factors engineering design of the second cockpit. The ASAP is influencing the cockpit's design by determining which crewman can best execute a specific task in order to maximize "task performance coordination efficiency." (12:11) Initial pilot training at VMFAT-101 will commence in October 1988 using FA-18A/B's. First delivery of the FA-18D Hornet to operational squadrons is scheduled for October 1989.

CONCLUSION

The 1990's will showcase the Marine Corps owning the most technological, versatile, and flexible tactical air arm in the world. Marine Aviation is quickly embarking on an exciting era with a composite force of tilt rotor and attack helicopters, and VSTOL and multi-mission strike-fighter aircraft. With the advent of the FA-18D strike fighter, the MAGTF commander will have unprecedented firepower, lethality, versatility, and reliability from a single source. Not since the Marine infantryman began carrying his own rifle has a weapon system been introduced into the Marine inventory with the potential impact of this two-seat Hornet. In the final analysis, the multi-dimensional capabilities being designed into the FA-18D will prove it to be a genuine force multiplier, enabling the MAGTF commander to meet the mission plurality requirements of the 1990's and beyond.

BIBLIOGRAPHY

A. REFERENCES CITED

Books

1. Shaw, Robert L., Cdr, USN. Fighter Combat: Tactics and Manuevering. Annapolis, MD: Naval Institute Press,1985.

Articles and Publications

2. Fagan, M. S., Maj, USMC, "USMC Manned TacRecce." Naval Institute Proceedings, (November 1986) pp. 110-112.

3. Kozicharov, Eugene. "USAF Selects F-15 as Dual-Role Fighter." Aviation Week & Space Technology. Vol 120 (March 5 1984), pp. 18-19.

4. O'Mara, K. P., Maj, USMC. "Past Performance and Mission Dictate the Corps Use a Two-Seat Fighter." Marine Corps Gazette. Vol 63 (August 1979), pp. 60-64.

5. Smith, K. A., Lt Gen, USMC. "On Land, Sea, and in the Air -- Marine Aviation FY-87 Posture Statement." Marine Corps Gazette, Vol 70 (May 1986), pp. 68-76.

6. Smith, K. A., Lt Gen, USMC. "Marine Aviation FY-86 Posture Statement." Marine Corps Gazette, Vol 69 (May 1985), pp. 49-50+.

7. Sullivan, J. J., Lt Col, USMC. "Determining Fighter Aircraft Design." Marine Corps Gazette, Vol 69 (October 1985), p. 26.

8. Trotter, T. W., Lt, USN. "One Seat Versus Two." Naval Institute Proceedings, Vol 112 (October 1986), pp. 75-80.

Official Documents

9. US Air Force Armament Development and Test Center. "AMRAAM - Advanced Medium Range Air-To-Air Missile: AIM-120A." Program Management Plan. Eglin AFB, FL: April 1986.

10. US Department of the Navy. "F/A-18 Development Plan." Washington DC: Naval Air Systems Command, October 1986.

Unpublished Material

11. Allen Corporation. " FA-18D Situation Analysis Report." September 1986, Alexandria, VA.

12. -----, " FA-18D Operator Task Analysis Report," December 1986, Alexandria, VA.

13. McDonnell Aircraft Corporation. "Feasibility Study to Predict Fighter Pilot Combat Effectiveness." Technical Report No. E1634. St Louis MO, 1979.

B. RELATED SOURCES

Books

Spick, Mike. Fighter Pilot Tactics. New York: Stein and Day, 1983.

Articles and Publications

Day, Bonner. "The Pros and Cons of a Multimission Fighter Force." Air Force Magazine, Vol 62 (April 1979), pp 60-63.

Flanagan, W.A., Maj, USAF. "The Fighter Force -- How Many Seats?" Air University Review, Vol 32 (May-June 1981), pp. 2-21.

"Multi-role Combat Aircraft (MRCA)." Cockpit Intelligence, Vol 75 May 1975), pp. 29-38.

"One Seat Fighter Versus Two." Aviation News & Space Technology, Vol 114 (May 18, 1981), pp.12-13.

CONTINUED

Smith, K. A., Lt Gen, USMC and Williams, R. A., Maj, USMCR. "Marine Air - Hot and Getting Hotter." Naval Institute Proceedings, Vol 112 (October 1986), pp.156-161.

Tegler, John. "The Best Carrier Aircraft." Naval Institute Proceedings, Vol 112 (October 1986). pp. 80-82.

Official Documents

Center for Naval Analysis. F/A-18 Single- Versus Dual-seat Crew Simulation Results: Summary and Conclusions. Report No. 86-1633. Alexandria, VA: Warfare Operations Division, 28 August 1986. CONFIDENTIAL. Classified by OPNAVINST 5513.2B-26. Declassify on OADR.

Congressional Research Service. F/A-18 Hornet: Background Analysis of the Navy/Marine Corps F/A-18 Fighter/Attack Aircraft Program. Washington DC: Library of Congress, December 15, 1978.

-----. Fighter Aircraft Program: F/A-18. Washington D.C.: Library of Congress, January, 1980.

US Air Force. Dual Role Fighter Study. Washington DC: Assistant Chief of Staff, Studies and Analysis, July 1984.

US Air Force Systems Command. Advanced Air-Ground Fighter Technology Integration Study. Technical Report No. AFFDL-TR-75-198. Wright-Patterson AFB, OH: Flight Dynamics Laboratory, October 1975.

-----. A Study of One-Versus-Two Seat Target Acquisition Weapon Delivery. Technical Report No. ASD-TR-80-5017. Wright-Patterson AFB, OH: Aeronautical Systems Division, January 1980.

CONTINUED

-----. Crew Size Evaluation for Tactical All-Weather Strike Aircraft. Technical Report No. AFAL-TR-76-79. Wright-Patterson AFB, OH: Air Force Avionics Laboratory, 1979.

US Defense Nuclear Agency. Tactical Warning and Survivability of Dual-Capable Aircraft. Technical Report No. 81-57. Washington, 30 November 1981.

-----. The Role of Dual Capable Aircraft in the 1980s (U). Technical Report No. DNA 5269F. Washington DC, January 1980.

Unpublished Materials

Analytical Services, Inc. "Enhanced Tactical Fighter Crew Size Consideration." Arlington, VA, November 1978.

Burney, David L., Maj, USAF. "Priority Tasking for Multimission Aircraft." Research study prepared at the Air Command and Staff College, Air University, Maxwell AFB, AL, May 1973.

Buchanan, John R., Maj, USA. "Army Light Helicopter Family (LHX): Single or Dual Seat?" Research study prepared at the Air Command and Staff ollege, Air University, Maxwell AFB, AL, April 1986.

Edelen, R., Capt, USMC. "FA-18D Control/Display Review." Patuxent River, MD: Naval Air Test Center, June 1986.

Harrison, George B. "Night Attack -- An Unsolved Problem (U)." Research study prepared for the Air War College, Air University, Maxwell AFB, AL, April 1979.

Heaps, Robert S., Maj, USAF. "The Advanced Tactical Fighter: Capabilities and Manning for the NATO Mission." Research study prepared at the Armed Forces Staff College, Norfolk, VA, April 1982.

CONTINUED

McDonnell Aircraft Company, "F/A-18 Night Attack Preliminary Design Review" St. Louis, MO, 1 July 1986.

----, "F/A-18 Night Attack Review." St. Louis, MO, 19 August 1986.

Seavers, Carl. et. al., "Operation of F/A-18C/D Night Attack Avionics." 19th ASAP White Paper, St. Louis, MO, August 1986.

Suter, R. M., Lt Col, USAF. "Janus: A Concept for a Multi-purpose Autonomous Fighter." A conference draft presented at the Air University Airpower Symposium, Air War College, Maxwell AFB, AL, 3-5 March 1980.

US General Accounting Office. "Concerns about the Air Force Approach to the Dual Role Fighter Comparison." Washington DC, 19 January 1984.

US Marine Corps. "F/A-18D Progress Report." Operational Development Team (ODT), NAS Lemoore, California, October 1986.

Welde, John L., Maj, USAF. "Single Seat Versus Dual Seat Fighter Effectiveness."Research project prepared at Armed Forces Staff College, Norfolk, VA, 1977.

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